

ANALYSIS OF THE VEHICLE FIRE OF MAY 30, 2020  
AT 1400 BLOCK OF JOHN F. KENNEDY BOULEVARD  
PHILADELPHIA, PENNSYLVANIA

*United States*  
vs.  
*Anthony Smith*

In The United States District Court  
For The Eastern District of Pennsylvania  
Case No. 20-CR-00368

By

A handwritten signature in black ink, appearing to read "Douglas J. Carpenter". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

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Submitted to:

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May 20, 2022

## **INTRODUCTION**

This analysis of the vehicle fire incident, which occurred at the 1400 Block of John F. Kennedy Boulevard, Philadelphia, Pennsylvania is prepared pursuant to Rule 26 of the Federal Rules of Civil Procedure. It is intended to serve as a disclosure of my expert opinions concerning this vehicle fire incident. This analysis is based on my review of documents, evidence, and information concerning the fire incident that occurred on May 30, 2020. A list of the material reviewed is given as Appendix A.

In developing my analysis and opinions, I have relied heavily on my knowledge of the Combustion and Fire Sciences, Chemistry and Chemical Engineering, Mechanical Engineering, Fire Protection Engineering, Fire Dynamics, Explosion Dynamics, Fire Modeling, Heat Transfer, Smoke and Fire Detection and Notification, Fire Origin and Cause Investigations, Ignition, Flame Spread, and Toxicology. Additional information on my experience and training is provided in Appendix B (Resume and List of Publications).

The fee for preparation of this report and for testimony by deposition or in court is \$350/hour for Mr. Carpenter. A list of my testimony by deposition or in court over the last five (5) years is given in Appendix C.

The analysis and opinions expressed in this expert report are based on my knowledge of facts and information reviewed to date. All opinions are held to a reasonable degree of scientific and engineering certainty. If my opinions (or the bases for them) as expressed below change or if new opinions are formulated as a result of additional information that becomes available, I will amend or supplement my opinions appropriately.

## **BACKGROUND**

On May 30, 2020, several police vehicles were damaged by fire on the 1400 block of John F. Kennedy Boulevard and in the surrounding area. Police Unit C-109 was a white, unmarked Philadelphia Police Department, 2012 Chevrolet Impala Sedan (Vehicle Identification Number: 2G1WD5E39C1282980; Pennsylvania license plate MG2189K; City of Philadelphia Public Property #125127). Police Unit C-109 was one of the fire-damaged vehicles. The fires coincided with public protests that occurred in Center City Philadelphia metropolitan area. Police Unit C-109 was later towed and secured at the office of Fleet Management (OFM) lot located at 100 East Hunting Park Avenue in Philadelphia, Pennsylvania.

On May 31 and June 10, 2020, members of the Philadelphia Fire Marshal's Office (PFMO) and the Bureau of Alcohol, Tobacco, Firearms & Explosives (ATF) Philadelphia Arson Task Force conducted a physical examination of Police Unit C-109 at the OFM lot. The scene portion of the fire origin and cause investigation was conducted at OFM Shop 134, on May 31 and June 10, 2020. The objective of fire investigation was to establish the fire origin and cause, which destroyed Police Unit C-109.

On June 11, 2020, Special Agent / Certified Fire Investigator (SA/CFI) Edwards telephonically interviewed Philadelphia Police Officer Robert Anderson of the Civil Affairs Unit. Officer Anderson was scheduled to work 8:00 a.m. until 4 p.m. on May 30, 2020, but his tour was extended due to the public protests. Officer Anderson was operating vehicle C-109 that day. Officer Anderson stated that he parked his vehicle on John F. Kennedy Boulevard near N. 15th Street in response to a call for assistance from a police lieutenant. After parking the C-109 vehicle, Officer Anderson shut off the engine, ensured the windows were closed, and locked the doors after exiting. Officer Anderson stated that his brief case, personal items and police bag were

locked in the trunk. Officer Anderson reported no mechanical or electrical issues with Police Unit C-109. He also stated that no flammable liquids or road flares were stored inside of the vehicle.

Officer Anderson stated that he was assisting other officers when he observed a group of protesters rocking the car, smashing windows, and eventually overturning it over on its roof. Later, he observed the car on fire. Officer Anderson did not observe anyone setting the vehicle on fire. He advised that officers were unable to approach the vehicle because of the size of the crowd surrounding it.

Evidence shows that a burning road flare was introduced into the interior of the vehicle, resting on the interior headliner in close proximity to the front seat headrest. Figure 1 shows an aerial photograph depicting the burning vehicle subsequent to the introduction of the road flare to the interior of the vehicle. As the fire grew within the interior of the vehicle, flames began venting from the openings as a result of the development of a fully-involved, under-ventilated compartment fire.

After the fire was initiated and growing in size, unidentified protesters introduced lightweight and ordinary combustible materials (e.g., paper and/or light cardboard, a plant, and a 2" x 4"- dimensional lumber) to the interior of the vehicle. One of those unidentified protestors was Anthony Smith, who is shown in Figures 1 and 2 retrieving a white-in-color, sheet of paper/cardboard from the ground in the vicinity of the front of the burning vehicle. Figure 3 then shows an aerial view photograph of Anthony Smith introducing this white sheet of paper/cardboard through an opening and into the under-ventilated compartment fire within the interior of the vehicle.

Based upon the scene examination, an analysis of fire dynamics, and a review of photographs/videos of the incident (Figure 4), which depicted an activated flare inside the

passenger compartment and additional persons adding fuel, PFMO and ATF fire investigators determined that the fire originated inside of the passenger compartment of C-109.



**Figure 1 – Aerial Photograph of Anthony Smith Approaching the Side of the Burning Vehicle.**

The first fuels potentially ignited include, but are not limited to, readily available combustible materials already present inside of C-109 and items introduced by unidentified persons such as paper, cardboard, a plant, and a wood board. Photographs and video recorded at the time of the incident demonstrate that an unidentified person deliberately inserted a burning road flare into the passenger compartment of C-109. No fire was visible prior to that act. Burning road flares generate temperatures of approximately 2,650 °F (1,450°C), produce significant heat release rates, and are commonly sold in durations of 15 minutes, 20 minutes and 30 minutes. The high temperature, heat release rate, and extended burn time make them suitable ignition sources for many different fuel packages including the headliner and upholstered seating. Shortly thereafter, flames became visible and fire extended throughout the vehicle.



**Figure 2 – Aerial Photograph of Anthony Smith Retrieving a White Sheet of Paper/Cardboard from the Street in Front of Burning Vehicle.**

It was the determination of the PFMO and ATF investigators that the fire originated inside the passenger compartment of C-109. The competent ignition source was identified as an open flame, specifically a burning road flare introduced to the interior passenger compartment. The road flare ignited combustible materials to include combustible items inside the vehicle as materials introduced to aid in the propagation of the fire. The circumstances that brought the ignition source and first fuels together was an intentional act by a person(s); therefore, this fire is classified as *INCENDIARY*.

## **METHODOLOGY**

The general purpose of the investigation of fire and explosion incidents is to determine the fire *origin*, *fire cause*, responsibility, and means of prevention of fire and explosion incidents. In order to produce valid and scientifically reliable determinations, an investigator must follow the Scientific Method as outlined in NFPA 921, *Guide for Fire and Explosion Investigations* [1].

NFPA 921 is the modern accepted science and methodologies in fire investigation. In addition, NFPA 1033, *Standard for Professional Qualifications for Fire Investigator* [2], provides that qualified fire investigators shall employ all elements of the Scientific Method as the operating analytical process throughout the investigation and for the drawing of conclusions.



**Figure 3 – Aerial Photograph of Anthony Smith Introducing a White Sheet of Paper/Cardboard into Opening of Burning Vehicle.**

The Scientific Method is the generally accepted methodology for conducting investigations in the physical and chemical sciences. The Scientific Method delineates a process by which a valid<sup>1</sup> hypothesis, once formulated with *evidence*, is tested against all available *evidence* and the accepted principles of science and mathematics to determine if the hypothesis remains valid and if it explains an observed outcome or result. Otherwise, it is an invalid hypothesis that has been disproved.

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<sup>1</sup> An *invalid hypothesis* is any hypothesis formulated without *evidence*.



The typical steps to follow in the Scientific Method, as applied to the investigation of fire and deflagration incidents, are to define the problem being investigated, collect all available *data*, analyze the data and *evidence*, develop a working hypothesis, and test the hypothesis to determine if it fits with the available *evidence* and the accepted principles of science and mathematics. This process must be repeated until a hypothesis is formulated that is uniquely consistent with all of the available *evidence* and there is no *evidence* that disproves the hypothesis.

The Scientific Method as applied to the investigation of fire and explosion incidents requires *evidence* (defined as data that is both relevant and reliable) in order to formulate a valid hypothesis. The Scientific Method also requires *evidence* in order to disprove a valid hypothesis. If, during the course of investigation, additional data and *evidence* relating to the incident becomes available, then the investigator may need to appropriately amend the original hypothesis to account for the new *evidence*. Thus, the Scientific Method may require an iterative process before one final valid hypothesis that is uniquely consistent with the available *evidence* can be reached.

*Data* collection includes information obtained from the fire scene observations, from testing physical artifacts, from witness statements, and other forms of documentation. The *data* and *evidence* are used to first formulate hypotheses concerning the *origin* of the fire (NFPA 921 Chapter 18). Potential areas of the building are considered as *origin* hypotheses and may be disproved if the *origin* is inconsistent with the *data* and *evidence* obtained or if the origin is not possible based upon the principles of fire science, knowledge of the dynamics of fire, and its interaction with the environment.

## **ANALYSIS**

At “issue” in this case is the determination of the *origin* and *fire cause* and an analysis of the two (2) criminal charges of *arson*. The *origin* and *fire cause*, and the analysis of the *arson*



charges are all hypotheses that can be formulated and tested with evidence by applying the Scientific Method as specified by NFPA 921 [1] and NFPA 1033 [2].

With respect to the fire *origin*, based on the available evidence including photo and video documentation, the *area of origin* for this fire was within the interior of the Philadelphia Police Department Car C-109. More specifically, the *area of origin* was located at the interior headliner adjacent to the front seat head rests.

A *fire cause* determination requires the identification of three (3) elements; 1) the first item ignited, 2) the competent ignition source for the first item ignited, 3), how the first item ignited and the competent ignition source came together to initiate the fire [1]. Based on the available evidence, the first item ignited was identified as the upholstered interior headliner of the vehicle. The competent ignition source for the first item ignited is identified as an ignited road flare, as shown in Figure 4. How the first item ignited and the competent ignition source came together is identified as an unidentified male who placed the ignited road flare into the interior headliner of the vehicle.

A more specific issue is associated with the two (2) criminal charges of arson and one (1) criminal charge of aiding and abetting the arson. Arson is a criminal act predicated on the occurrence of a fire with a determined *fire cause classification* of an *incendiary fire cause*. An *incendiary fire* is a fire that is deliberately ignited with the intent to cause a fire to occur in an area where one was not going to occur, otherwise. Thus, the crime of arson involves the deliberate initiation of a fire.

In this case, there is no evidence that Anthony Smith had any involvement in the deliberate initiation of this vehicle fire through the introduction of a lit road flare by its introduction to the interior of the vehicle by an unidentified person. His actions involved the introduction of a sheet

of white paper/cardboard into an already established vehicle fire, as shown in Figure 5, thus, the introduction of this combustible was not a “first fuel ignited” and had no association with the initiation of the fire or the *fire cause*, as defined in NFPA 921 [1].



**Figure 4 - Photograph of Ignited Road Flare on Headliner of Overturned Vehicle.**

The term “aiding and abetting” can be defined as the act of helping, encouraging, or supporting someone in the commission of a crime. While “aiding and abetting” is a crime, the specific crime in this incident is arson and the commission of the crime is the intentional act of initiating a vehicle fire. There is no evidence in this case that Anthony Smith helped, encouraged, supported, aided, or abetted the unidentified individual who initiated this vehicle fire through the introduction of a lit road flare into the vehicle.



**Figure 5 - Screen Capture from Video of Anthony Smith Introducing Paper/Cardboard into Opening of Burning Vehicle.**

While the addition of combustibles to the burning vehicle can contribute to an increase in the growth rate or spread of the fire inside the vehicle, if such actions take place after the initiation of the fire, its introduction and potential contribution is not associated with the initiation of the fire and, thus, is not related to the crime of arson. In addition, the placing of a relatively small sheet of paper/cardboard in the interior of the vehicle would not significantly contribute to an increase in the growth or spread rate of the fire. In terms of total energy released in a fire, passenger vehicles have a total energy release on the order of 1000's of megajoules (MJ) [3].

In contrast, a sheet of standard sized paper has a total energy release on the order of 0.1 MJ; four orders of magnitude less in total energy release than the total energy release for passenger vehicles. For standard sized poster board/cardboard, the total energy released is on the order of 1 MJ; three orders of magnitude less in total energy release than for the total energy release of passenger vehicles.

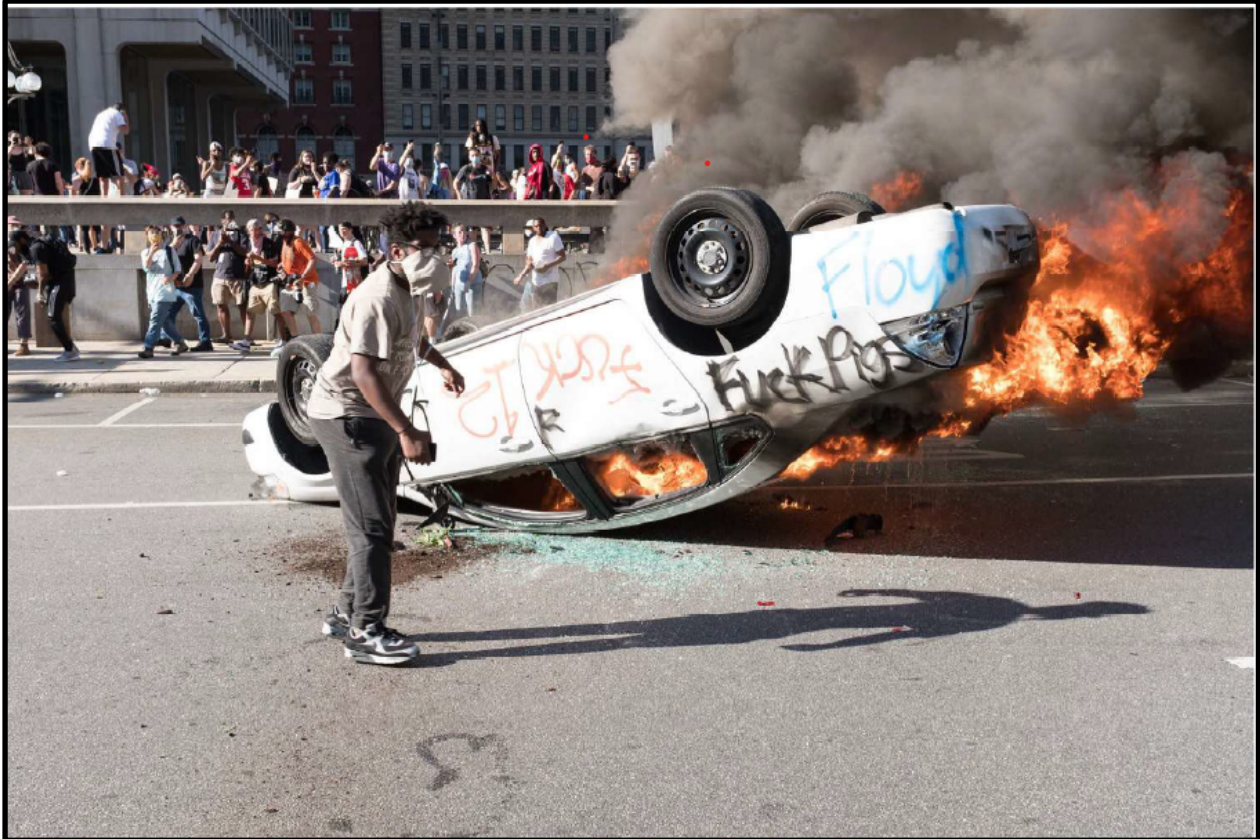
In addition, at the time of the introduction of the white sheet of paper/cardboard to the interior of the burning vehicle, as shown in Figure 6, flames are extending from openings that communicate to the interior of the burning vehicle. Flame extension from openings in compartment fires are a visual indication that the compartment fire is burning in a ventilation-controlled combustion mode versus a fuel-controlled combustion mode [4].

In the initial stage of a compartment fire, the size of the fire (i.e., heat release rate) is controlled by how much surface area is involved in the combustion process. Flame spread across combustible surfaces increases the size of the fire by increasing the heat release rate through the involvement of more fuel. Thus, the amount of fuel involved controls the size of the fire.

In contrast, the chemical and combustion process requires an oxidant to burn the fuel. The oxidant in this case is the oxygen in air. Combustion will occur when the fuel-to-air ratio is within the flammability limits of the fuel under specific conditions. The combustion process (i.e., “burning”) will not take place if there is insufficient fuel-to-air ratio. As the compartment fire grows in size (i.e., heat release rate), the quantity of air required to support combustion increases. When the compartment walls, ceiling, and floor restricts natural air flow into the compartment fire and the maximum rate of air flow is achieved at compartment openings (e.g., doors and windows), the compartment fire transitions from the fuel-controlled combustion mode to a ventilation-controlled combustion mode.

Thus, subsequent to the transition from a fuel-controlled compartment fire to a ventilation-controlled compartment fire, any increase in fuel, as provided by Anthony Smith, would not have increased the size or rate of fire spread in the compartment fire. Therefore, based on the preceding analysis, the contribution of paper/cardboard for an increase in the size of the fire and an increase in fire growth rate and spread is de minimis in this incident.





**Figure 6 - Photograph of Anthony Smith After Introducing the Sheet of White Paper/Cardboard into Burning Vehicle.**

There is a subsequent “at issue” related to how many times Anthony Smith introduced paper/cardboard into the burning vehicle. The photographs in Figures 3 and 6 have been used as evidence to hypothesize that Anthony Smith introduced paper/cardboard at two different points in time, based on the difference in visible fire conditions. More specifically, a difference in the visible volume of flames. A screen capture of the video, showing Anthony Smith after introducing a sheet of white paper/cardboard to the burning vehicle, is shown in Figure 7. A comparison of Figures 3 and 5, appears to show the visible flame volume in Figure 3 is greater than the flame volume observed in Figure 5. However, differences in the viewing angle and the presence of dark smoke obscuring the flames, in Figure 3, provides an explanation for the difference in visible flame volumes observed.

A more detailed comparison of Figures 3 and 5, Figures 6 and 7, and Figures 5 and 7, all demonstrate continuity in Anthony Smith's location and body position and are consistent with the same continuous action. This evidence disproves the hypothesis that Anthony Smith introduced a white sheet of paper/cardboard to the interior of the vehicle, more than once. There is no other evidence that would allow the formation of a valid hypothesis other than Anthony Smith introduced the paper/cardboard to the interior of the vehicle, only once, during this incident.



Figure 7 - Screen Capture from Video of Anthony Smith Adjacent to the Side of the Vehicle After Introducing a Sheet of White Paper/Cardboard to the Burning Vehicle.

## SUMMARY OF CONCLUSIONS

Based on the available *evidence*, reliable application of the Scientific Method, and the preceding analysis, CSE has reached the following determinations and opinions:

- At “issue” in this case is the *origin*, *fire cause*, and two (2) criminal charges of *arson* and one (1) charge of aiding and abetting a criminal act.

- The *area of origin* for this fire was determined to be within the interior of the Philadelphia Police Department Car C-109. More specifically, the *area of origin* was determined to be located at the interior headliner adjacent to the front seat head rests.
- The first item ignited was identified as the upholstered interior headliner of the vehicle. The competent ignition source for the first item ignited was identified as an ignited road flare. How the first item ignited and the competent ignition source came together was identified as an unidentified male who placed the ignited road flare into the interior headliner of the vehicle.
- The crime of arson involves the deliberate initiation of a fire. There is no evidence that Anthony Smith had any involvement in the deliberate initiation of this vehicle fire through the introduction of a lit road flare by its introduction to the interior of the vehicle by an unidentified person.
- “Aiding and abetting” can be defined as the act of helping, encouraging, or supporting someone in the commission of a crime. There is no evidence in this case that Anthony Smith helped, encouraged, supported, aided, or abetted the unidentified individual who criminally initiated this vehicle fire through the introduction of a lit road flare into the vehicle.
- Based on fire dynamics analysis, the contribution of paper and/or poster board for the purpose of increasing the size of the fire and/or increasing the fire growth rate and spread is de minimis in this incident.



- An analysis of the video and photographic evidence disproves the hypothesis that Anthony Smith introduced a white sheet of paper/cardboard to the interior of the vehicle, twice. There is no other evidence that would allow the formation of a valid hypothesis other than Anthony Smith introduced the paper/cardboard to the interior of the vehicle, only once, during this incident.

## **REFERENCES**

1. NFPA 921, Guide for Fire and Explosion Investigations, 2017 Edition, National Fire Protection Association, Quincy, MA.
2. NFPA 1033, Standard for Professional Qualifications for Fire Investigator, 2014 Edition, National Fire Protection Association, Quincy, MA.
3. Spearpoint, M. J., Tohir, M. Z. M., Abu, A. K., and Xie, P., “Fire Load Energy Densities for Risk-Based Design of Car Parking Buildings,” *Case Studies in Fire Safety*, 3, pp. 44-50, 2015.
4. Drysdale, D., An Introduction to Fire Dynamics, third edition, John Wiley & Sons, Ltd., West Sussex, United Kingdom, 2011.

**Appendix A**  
**List of Reviewed Materials**

### **List of Reviewed Materials**

- 31 Photographs of Fire Scene.
- Video Labeled “Demers-Arson-0220174844”.
- Video Labeled “FLET7843”.
- Video Labeled “State v. LaFrance-Arson-021813452”.
- Document Labeled “Disco p1-78 Re-Redacted”.
- Document Labeled “Supp Disc p79 – p82 (Superior Court Complaints)”.

## **Appendix B**

### **Resumes and Lists of Publications**

## **DOUGLAS J. CARPENTER, MScFPE, CFEl, PE, FSFPE**

### **EDUCATION:**

M.S., Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, MA, 1996.

B.S., Mechanical Engineering, University of Vermont, Burlington, VT, 1992.

A.S., Mechanical Engineering, Vermont Technical College, Randolph Center, VT, 1984.

### **THESIS:**

Carpenter, D. J., “An Investigation into the Validity of Modeling Post-Flashover Fires and Flame Extension from Openings with the Fire Field Model JASMINE”, Worcester Polytechnic Institute, August 1996.

### **PROFESSIONAL EXPERIENCE:**

**Research Assistant Professor, Department of Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, MA, 2009 to 2016.** Appointment for research collaboration with faculty in the area of fire protection engineering.

**Adjunct Lecturer, Department of Fire Protection Engineering, University of Maryland, College Park, MD, December 2004 to 2016.** Adjunct Lecturer for graduate level distance learning course Advanced Fire Dynamics for the Department of Fire Protection Engineering at the University of Maryland.

**Vice-President and Principal Engineer, Combustion Science & Engineering, Inc., Columbia, MD, 1998 to present.** Responsibilities include fire investigations, fire reconstruction analyses, and performing fire hazard analyses utilizing computer fire modeling including both zone models and Computational Fluid Dynamics (CFD). Applied quantitative and performance-based fire hazard analysis skills to a wide range of projects including nuclear production reactors and facilities at DOE’s Savannah River Site, building atria, manufacturing operations, transportation vehicles, airports, as well as United States research facilities and airport operations in Antarctica. Developed a flame-spread model for use in a CFD model of burning vehicles. Developed and taught classes and seminars in fire investigation, performance-based fire safety design, and computer fire modeling for such organizations as the Society of Fire Protection Engineers (SFPE) and the International Council of Building Officials (ICBO). Panel Member for Nuclear Regulatory Commission’s PIRT (Phenomenon Identification Ranking Table) review process associated with computer fire modeling in the commercial nuclear environment. Contributed to Volume 3: Fire Dynamics Tools (FDT) as part of the NIST’s verification and validation of selected fire models for nuclear power plant applications.

**Staff Engineer, Hughes Associates, Inc., Baltimore, MD, 1996 to 1998.**

Conducted in-house cone calorimeter tests for code equivalency evaluations and fire litigation support. Performed fire hazard analysis for military aircraft hush houses to determine technical requirements for alternative suppression system to existing Halon 1301 systems. Performed a review of fire hazards and fire suppression system options for the Halifax Class frigates of the Canadian Navy. Developed a computer program for the military evaluating alternative systems for existing Halon 1301 systems. Performed a comprehensive evaluation of the military's current Halon 1211 replacement program. Conducted on-scene fire investigations and computer fire modeling in support of fire litigation work. Conducted experiments that mapped the heat flux of Halogen Torchier Lamps for development of a model to determine ignition potential of adjacent combustibles.

**Fire Protection Engineer, Office of Polar Programs, National Science Foundation, Arlington, VA, 1995-1996.** Assisted engineers in examining fire protection engineering issues associated with Amundsen-Scott South Pole, McMurdo, and Palmer Stations in Antarctica. Projects emphasized equivalent levels of protection for fire hazards and life safety using a systems and performance-based engineering approach in this unique and challenging environment. Actively involved with the fire protection specification and design for the proposed new research station at the South Pole as part of the South Pole Redevelopment Project (SPRP). Conducted a fire risk assessment of buildings in McMurdo Station, which included computer fire modeling. Conducted on-site visits of McMurdo and Amundsen-Scott South Pole Station.

**Fire Protection Engineer, ABASCO Services, Inc., Augusta, GA, 1993.**

Six-month graduate internship. Responsible for developing a framework for an alternative methodology to the average combustible loading method for fire barrier analysis. Reviewed and provided written critique for proposed on-site work connected with fire protection at the Department of Energy's Savannah River Site.

**Fire Protection Engineer, MBS Fire Technology, Inc., Worcester, MA, 1993.**

Six-month graduate internship. Part of a team responsible for writing a revision of a fire hazard analysis for a nuclear production reactor using a performance-based approach. Provided recommendations for alternative methods to using Halon 1301 for fire protection within the reactor environment. Reviewed and provided written critique for proposed on-site work connected with fire protection at the Department of Energy's Savannah River Site.

**PROFESSIONAL REGISTRATION AND CERTIFICATION:**

Certified Fire and Explosion Investigator, National Association of Fire Investigators, 2005.

Professional Engineer (P.E.), State of Maryland, License No. 32633.

Professional Engineer (P.E.), Commonwealth of Virginia, License No. 0402055826.

Fire Investigation for Fire Officers, IAAI Certification, 25 Hours, CFI Trainer, 2020.

Principles of Fire Investigation Multi-Program, IAAI Certification, 67 Hours, CFI Trainer, 2020.

## **HONORS AND AWARDS:**

Photography Competition, 1<sup>st</sup> Place Accidental Fire Cause, International Association of Arson Investigators (IAAI), 2020.

Fellow, Society of Fire Protection Engineers, April, 2014.

Antarctic Service Medal of the United States of America, May, 1999.

Salamander Honorary Fire Protection Engineering Society, May 1995.

Campus Safety Association Scholarship Award, May 1995.

Percy Bugbee Fire Protection Engineering Scholarship, May 1995.

M&M Protection Consultants Scholarship, May 1994.

Dean's List at University of Vermont: Fall 1988, 1991, Spring 1992.

## **PATENTS:**

Roby, R. J. and Carpenter, D. J., “**Use of Buoyant Gases for the Simulation of Real Fire Sources**,” U.S. Patent No. 8,413,530, Issued April 9, 2013.

## **PROFESSIONAL MEMBERSHIP:**

Member, International Association for Fire Safety Science (IAFSS).

Member, National Fire Protection Association (NFPA).

Fellow, Society of Fire Protection Engineers (SFPE).

Member, National Association of Fire Investigators (NAFI).

Member, International Association of Arson Investigators (IAAI).

Member, DC/MD Chapter, International Association of Arson Investigators.

Member, American Society of Mechanical Engineers (ASME).

Member, American Society of Testing and Materials (ASTM).

Member, Building Officials Code Administration (BOCA).

Member, NFPA 92B Task Group, 1998.

Member, SFPE Task Group on Computer Model Evaluation, 1998-present.

Member, SFPE Educational Committee, 1999 – present.

Member, IAAI Fire & Arson Investigator Editorial Review Board, 2006 – present.

Alternate Member, NFPA 921, *Guide for Fire and Explosion Investigations*, 2000 – 2018.

Associate Member, Engineering Sciences, American Academy of Forensic Sciences (AAFS), 2006.

Member, Arson Review Committee (ARC), The Innocence Project, NYC, 2005 – present.

## **PROFESSIONAL BOARD MEMBERSHIP:**

Member, Board of Advisors, Fire Protection Engineering Department, WPI, 2009 – 2016.

Member, IAAI Fire & Arson Investigator Editorial Review Board, 2006 – present.

## **REVIEWS OF ARCHIVAL JOURNALS AND PUBLICATIONS:**

Peer Reviewer, *Fire Technology*, 2009 – present.



Peer Reviewer, *Fire Safety Journal*, 2007 – present.  
 Peer Reviewer, *Journal of Forensic Sciences*, 2012 – present.  
 Peer Reviewer, *Forensic Science International*, 2015 – present.  
 Reviewer, *Fire & Arson Investigator*, 2006 – present.

## INSTRUCTOR:

**“Advanced Fire Dynamics”**, Adjunct Lecturer for graduate level distance learning course for the Department of Fire Protection Engineering at the University of Maryland, December 2004 – present.

**“Introduction to Fire Modeling”**, two-day course sponsored by the Society of Fire Protection Engineers (SFPE), **Atlanta, GA**, November 12 –13, 1998; **Baltimore, MD** May 13 –14, 1999, **Baltimore, MD** October 2 – 3, 2000, **Idaho Falls, Idaho**, May 7 - 8, 2002.

**“Introduction to Fire Modeling”**, one-day course sponsored by the International Fire Code Institute (IFCI), the International Conference of Building Officials (ICBO), and the Society of Fire Protection Engineers (SFPE), **St. Paul, MI**, November 17 & 19, 1998; **Tacoma, WA**, January 28, 1999.

**“Engineering Design Alternatives”**, one-day course sponsored by the International Fire Code Institute (IFCI), the International Conference of Building Officials (ICBO), and the Society of Fire Protection Engineers (SFPE), **Tacoma, WA**, January 29, 1999; **Dallas, TX**, April 7, 1999.

**“The Fire Safety Engineering Method”**, five-day course sponsored by Canadian Association of Building Code Officials, **Winnipeg, Canada**, May 30<sup>th</sup> - June 4<sup>th</sup>, 1999.

**“Advanced Computer Fire Modeling”**, two-day course sponsored by the Society of Fire Protection Engineers (SFPE), **New Orleans, LA**, November 11 – 12, 1999; **Baltimore, MD**, October 4 – 5, 2000, **Santa Fe, NM**, March 14 – 15, 2002.

**“Introduction to Fire Dynamics Simulator (FDS) and Smokeview”**, three-day course sponsored by the Society of Fire Protection Engineers (SFPE), **Baltimore/Washington**, September 16 – 18, 2002, **Las Vegas**, March 23 – 25, 2004, **Chicago**, September 21-23, 2004, **Hawaii**, February 1-3, 2005, **Chicago**, August 14 -16, 2006.

**“Advanced Fire Dynamics Simulator (FDS) and Smokeview”**, three-day course sponsored by the Society of Fire Protection Engineers (SFPE), **San Diego**, October 19 – 21, 2005, **Baltimore**, October 18 – 20, 2006, **Las Vegas**, October 16 – 19, 2007, **Charlotte, NC**, October 15-17, 2008, **Scottsdale, AZ**, October 21 – 23, 2009.

**“Use of Quantitative Tools for Analysis of Fire Dynamics”**, two-day course sponsored by the Society of Fire Protection Engineers (SFPE), **Portland, OR**, October, 2011.

**“Fire Patterns and Investigation,”** Module 5, four-day course for criminal technicians employed at the National Forensic Center of the Danish National Police, **Copenhagen, Denmark, and Revinge, Sweden**, June 11<sup>th</sup>, 12<sup>th</sup>, 15<sup>th</sup> – 18<sup>th</sup>, 2015.

## **CONTINUING EDUCATION:**

**FPE 580L “Case Studies in Fire Safety Engineering Science”**, Worcester Polytechnic Institute, Advanced Distance Learning Network (ADLN), 16-week course, Instructor: Dr. Patrick J. Pagni, University of California at Berkley, Fall, 2000.

**“Smoke Management for Atria and Other Large Spaces”**, one-day course sponsored by the Society of Fire Protection Engineers (SFPE), and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Baltimore, MD, October 6, 2000.

**“Accreditation, Certification, and Certificates,”** IAAI tested training program (CFI Trainer), completed 4/3/2020, 3 credit hours.

**“An Analysis of The Station Nightclub Fire,”** IAAI tested training program (CFI Trainer), completed 9/14/2007, 4 credit hours.

**“Arc Mapping Basics,”** IAAI tested training program (CFI Trainer), completed 4/3/2020, 4 credit hours.

**“Basic Electricity,”** IAAI tested training program (CFI Trainer), completed 4/3/2020, 4 credit hours.

**“Charleston Sofa Super Store,”** IAAI tested training program (CFI Trainer), completed 4/6/2020, 4 credit hours.

**“Charting Your Career Path in Fire Investigation,”** IAAI tested training program (CFI Trainer), completed 4/10/2020, 3 credit hours.

**“Communicating the Value of Membership in the IAAI,”** IAAI tested training program (CFI Trainer), completed 4/10/2020, 0 credit hours.

**“Critical Evaluation and Testing of Commonly Reported Accidental Causes,”** IAAI tested training program (CFI Trainer), completed 4/8/2020, 3 credit hours.

**“Critical Thinking Solves Cases,”** IAAI tested training program (CFI Trainer), completed 6/4/2008, 4 credit hours.

**“Digital Photography and the Fire Investigator,”** IAAI tested training program (CFI Trainer), completed 12/18/2008, 4 credit hours.

**“Discovery in Civil Cases,”** IAAI tested training program (CFI Trainer), completed 4/13/2020, 3 credit hours.

**“Discovery in Criminal Cases,”** IAAI tested training program (CFI Trainer), completed 4/13/2020, 3 credit hours.

**“DNA,”** IAAI tested training program (CFI Trainer), completed 4/13/2020, 3 credit hours.

**“Documenting the Event,”** IAAI tested training program (CFI Trainer), completed 4/13/2020, 4 credit hours.

**“Effective Investigation and Testimony,”** IAAI tested training program (CFI Trainer), completed 1/21/2010, 3 credit hours.

**“Electrical Safety,”** IAAI tested training program (CFI Trainer), completed 4/9/2020, 3 credit hours.

**“Emerging Technologies in Fire Investigation,”** IAAI tested training program (CFI Trainer), completed 12/1/2020, 3 credit hours.

**“Ethical Duties Beyond the Fire Scene,”** IAAI tested training program (CFI Trainer), completed 4/28/2020, 3 credit hours.

**“Ethics & Social Media,”** IAAI tested training program (CFI Trainer), completed 4/29/2020, 3 credit hours.

**“Ethics and the Fire Investigator,”** IAAI tested training program (CFI Trainer), completed 2/14/2007, 3 credit hours.

**“Evidence Examination: What Happens at the Lab,”** IAAI tested training program (CFI Trainer), completed 4/10/2020, 4 credit hours.

**“Explosion Dynamics,”** IAAI tested training program (CFI Trainer), completed 4/3/2020, 4 credit hours.

**“Fire and Explosion Investigations: Utilizing NFPA 1033 and 921,”** IAAI tested training program (CFI Trainer), completed 1/25/2010, 4 credit hours.

**“Fire Chemistry,”** IAAI tested training program (CFI Trainer), completed 11/9/2017, 3 credit hours.

**“Fire Dynamics Calculations – Version 2.0,”** IAAI tested training program (CFI Trainer), completed 2/14/2007, 4 credit hours.

**“Fire Flow Analysis,”** IAAI tested training program (CFI Trainer), completed 4/8/2020, 3 credit hours.

**“Fire Investigation for Fire Officers,”** IAAI tested training program (CFI Trainer), completed 4/29/2020, 3 credit hours.

**“Fire Investigator Scene Safety,”** IAAI tested training program (CFI Trainer), completed 9/13/2007, 3 credit hours.

**“Fire Protection Systems,”** IAAI tested training program (CFI Trainer), completed 4/9/2020, 3 credit hours.

**“Fundamentals of Interviewing,”** IAAI tested training program (CFI Trainer), completed 4/30/2020, 4 credit hours.

**“Fundamentals of Residential Building Construction,”** IAAI tested training program (CFI Trainer), completed 5/5/2020, 3 credit hours.

**“How First Responders Impact the Fire Investigation,”** IAAI tested training program (CFI Trainer), completed 4/10/2020, 2 credit hours.

**“Insurance and the Fire Investigation,”** IAAI tested training program (CFI Trainer), completed 5/5/2020, 4 credit hours.

**“Introduction to Appliances,”** IAAI tested training program (CFI Trainer), completed 4/10/2020, 3 credit hours.

**“Introduction to Evidence,”** IAAI tested training program (CFI Trainer), completed 5/1/2020, 4 credit hours.

**“Introduction to Fire Dynamics and Modeling,”** IAAI tested training program (CFI Trainer), completed 2/6/2007, 4 credit hours.

**“Investigating Motor Vehicle Fires,”** IAAI tested training program (CFI Trainer), completed 3/2/2007, 4 credit hours.

**“MagneTek: A Case Study in The Daubert Challenge,”** IAAI tested training program (CFI Trainer), completed 1/21/2010, 2 credit hours.

**“NFPA 1033 and Your Career,”** IAAI tested training program (CFI Trainer), completed 4/10/2020, 2 credit hours.

**“Physical Evidence at the Fire Scene,”** IAAI tested training program (CFI Trainer), completed 4/29/2020, 4 credit hours.

**“Post-Flashover Fires,”** IAAI tested training program (CFI Trainer), completed 10/30/2008, 4 credit hours.

**“Process of Elimination,”** IAAI tested training program (CFI Trainer), completed 3/23/2016, 3 credit hours.

**“Residential Electrical Systems,”** IAAI tested training program (CFI Trainer), completed 4/30/2020, 4 credit hours.

**“Residential Natural Gas Systems,”** IAAI tested training program (CFI Trainer), completed 5/1/2020, 3 credit hours.

**“The Impact of Ventilation in Building Structures on Fire Development,”** IAAI tested training program (CFI Trainer), completed 1/5/2009, 4 credit hours.

**“The Practical Application of the Relationship Between NFPA 1033 and NFPA 921,”** IAAI tested training program (CFI Trainer), completed 4/8/2020, 2 credit hours.

**“The Scientific Method for Fire and Explosion Investigation,”** IAAI tested training program (CFI Trainer), completed 2/8/2007, 3 credit hours.

**“Thermometry, Heat, and Heat Transfer,”** IAAI tested training program (CFI Trainer), completed 4/3/2020, 3 credit hours.

**“Understanding Fire Through the Candle Experiments,”** IAAI tested training program (CFI Trainer), completed 1/25/2010, 4 credit hours.

**“Understanding Undetermined,”** IAAI tested training program (CFI Trainer), completed 4/29/2020, 3 credit hours.

**“Writing the Initial Origin and Cause Report,”** IAAI tested training program (CFI Trainer), completed 4/29/2020, 3 credit hours.

**“Principles of Fire Investigation,”** IAAI tested training program (CFI Trainer), completed 5/5/2020, 67 credit hours.

**“Fire Investigation for Fire Officers,”** IAAI tested training program (CFI Trainer), completed 4/29/2020, 25 credit hours.

## **SELECTED PUBLICATIONS AND PRESENTATIONS:**

### ***Presentations (Non-Peer Reviewed):***

Carpenter, D. J., **“Fire Science and Investigations: The Use of Toxicology Evidence in Fire Investigations,”** D25, 71<sup>st</sup> American Academy of Forensic Sciences, Annual Meeting, Baltimore, Maryland, February 18-22, 2019.

- Felthous, A. R., Weinstock, R., Carpenter, D. J., Martell, D. A., Oxley, J. C., Shefchick, T. P., Ubelacker, D., Warnick, A. J., Lentini, J., Yang, S., and Upshaw Downs, J. C., “**Fires and Explosions: A Multidisciplinary Overview of Investigative Methods, Mental States of Perpetrators, and Psychological Trauma to Victims**,” W17, American Academy of Forensic Sciences, Annual Meeting, Seattle, Washington, February 22-27, 2010.
- Dubs, L. A. and Carpenter, D. J., “**Forensic Science (Arson): Talisman or Trickery?**,” Seminar, North Carolina Advocates for Justice, Raleigh, NC, April 16, 2010.
- Carpenter, D., Warnick, A., Ubelacker, D., and Martell, D., “**Forensic Sampler: Firesetting and Bombing**,” 40<sup>th</sup> Meeting of the American Academy of Psychiatry and the Law, Baltimore, MD, October 29<sup>th</sup> – November 1, 2009.
- Carpenter, D., “**Practical Application of Fundamental Knowledge in Fire and Explosion Investigations**,” Canadian National Advanced Fire, Arson and Explosion Investigation Training Program, Toronto, Canada, October 29<sup>th</sup>, 2009.
- Carpenter, D. J., “**The Forensic Model**,” Session 4: The Real World – What Do We Actually Do with Fire Models?, Fire Modeling Workshop, National Institute of Standards and Technology (NIST), Gaithersburg, MD, Wednesday, April 29, 2009.
- Carpenter, D. J., and McAllister, J. M., “**Practical Application of Engineering Principals**,” International Association of Arson Investigators, 59<sup>th</sup> Annual Training Conference, Denver, Colorado, April 27 - May 2, 2008.
- Stauffer, E., Byron, D. E., and Carpenter, D. J., “**Analysis of Vegetable and Animal Oil Residues from Fire Debris Samples**,” W17, American Academy of Forensic Sciences, Annual Meeting, San Antonio, Texas, February 19-24, 2007.
- Cummings, W. M., and Carpenter, D. J., “**Performance-Based Analysis of ARFF Requirements at USAP Airfields**,” American Society of Civil Engineers (ASCE), Cold Regions Engineering Conference, Anchorage, AK, May 22, 2002.
- Carpenter, D. J., Zhang, W., Roby, R. J., “**Fire Dynamics Simulator (FDS)**,” National Institute of Standards and Technology, Seminar, November 19, 2002.
- Carpenter, D. J., “**Fire Protection in Antarctica**,” presented to the Chesapeake Chapter of the Society of Fire Protection Engineers, **College Park, Maryland**, April 30, 1998; New England Chapter of the Society of Fire Protection Engineers, **Boston, MA**, February 7, 2000.
- Watts, J. M., Jr., and Carpenter, D. J., “**Fire Dynamics and Fire Modeling & Human Behavior in Fire and Performance-Based Fire Safety Evaluation**,” State of Vermont, Department of Labor, **Rutland, VT**, January 31<sup>st</sup>, 2000.



West, L. E., Reiter, D. A., and Carpenter, D. J., “**Forensic Fire Investigation**”, The 2000 Claims Conference, Professional Loss Research Bureau (PLRB), **Chicago, IL**, March 26 – 29, 2000.

Carpenter, D. J., “**The Use of Quantitative Tools in Fire Investigation**,” presented to the Vermont Chapter of the International Association of Arson Investigators, **Randolph Center, VT**, December 3, 1998; New Jersey Chapter of the International Association of Arson Investigators, **Morristown, NJ**, June 18, 1999.

Carpenter, D. J., Beller, D., and Sapochetti, J., “**Using the “Scientific Method” in the Analysis of the Cause and Origin of the Fire at the Cococnut Grove: Development of a New Hypothesis**”, NFPA World Fire Safety Congress and Exposition, **Baltimore, MD**, May 16-20, 1999.

Carpenter, D. J., and Roby, R. J., “**Advanced Investigation and Technology: Application and Presentation of Fire Modeling in Arson Investigations**,” presented to the National Society of Professional Insurance Investigators 1999 Advanced Insurance Fraud Seminar, **Cincinnati, OH**, November 11, 1999.

Carpenter, D. J. and Hamer, A. J., “**The Modeling of Experimental Compartment Fires Using Computational Fluid Dynamics**,” presented at the 1998 STAR-CD North America User’s Conference, **Detroit, MI**, May 19-20, 1998.

***Conference Poster Sessions (Editorially Reviewed):***

Carpenter, D. J., and DiNenno, P. J., “**Halon Alternative Selection Tool Software**”, *Proceedings of the Halon Alternatives Technical Working Conference*, May 6-8, 1997, Albuquerque, NM.

Carpenter, D. J., and Barnett, J. R., “**The Modeling of Fire Tests Conducted at the National Research Council of Canada Using the Fire Field Model JASMINE**,” presented at the International Conference on Fire Research and Engineering, Orlando, FL, September 10-15, 1995.

***Conference Papers (Editorially Reviewed):***

Olenick, S.M., Roby, R.J., and Carpenter, D.J., “**Re-Visiting the Michael Ledford Fire Incident**,” *Proceedings of the International Symposium on Fire Investigation Science and Technology (ISFI)*, 2010.

Olenick, S.O., Roby, R.J., Carpenter, D.J., and Goodman, A., “**Evaluation of the NFPA 72 Spacing Requirements for Waffle Ceilings**,” *National Fire Protection Research Foundation Suppression and Detection Research Applications Symposium*, January, 2008.

Ferrino-McAllister, J.L, Carpenter, D., Roby, R., Torero, J., “**The Extent of Evaporation of Ignitable Liquids Under Exposure to Compartment Fires, Non-Fire Thermal and Non-Thermal Environments**”, *Proceedings from the 10th International Conference, Fire and Materials*, San Francisco, CA, 2007.



- Carpenter, D. J., Roby, R. J., and Torero, J. L., **“The Use of Toxicity Data in the Reconstruction and Analysis of Fires,”** *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.
- Carpenter, D. J., Roby, R. J., and Torero, J. L., **“Training vs. Education: The Case for the Development of a National Curriculum for Fire Investigators,”** *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.
- Ferrino-McAllister, J. L., Carpenter, D. J., and Roby, R. J., **“Comparison of Gasoline Weathering on Carpet Samples Exposed to Various Thermal Environments,”** *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.
- Sutula, J. A., Carpenter, D. J., Anderson, J., and Cometto, A., **“The Use of Animation as an Aid in the Presentation of Results of Computational Fluid Dynamics Modeling in Fire Reconstruction Analysis,”** *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.
- Carpenter, D. J., and Cummings, W., **“Performance-Based Analysis of ARFF Requirements for Air-Fields at McMurdo and South Pole Stations, Antarctica,”** NFPA World Safety Conference, Dallas, TX, May 18 - 21, 2003.
- Carpenter, D. J. and Zhang, W., **“Validation of Fire Modeling by Fire Dynamic Simulator for Fire Protection Engineering,”** NFPA World Safety Conference, Dallas, TX, May 18-21, 2003.
- Zhang, W., N. L. Ryder, R. J. Roby, and D. J. Carpenter, **“Modeling of the Combustion in a Compartment Fire by Large Eddy Simulation Approach,”** *Proceedings of the Chemical and Physical Processes in Combustion*, Eastern States Section of the Combustion Institute Fall Technical Meeting, Hilton Head, SC, December 2001.
- Sutula, J. A., Carpenter, D. J., and Roby, R. J., **“Use of the FDS Model to Analyze Two Competing Scenarios in an Alleged Arson Case,”** presented at 3<sup>rd</sup> Technical Symposium on Computer Applications in Fire Protection Engineering, Society of Fire Protection Engineers, Baltimore, MD, September 2001.
- Zhang, W., Hamer, A. J., Klassen, M. S., Carpenter, D. J., and Roby, R. J., **“Verification of the Turbulence Statistics for Fire Dynamic Simulator in a Room Fire,”** presented at 3<sup>rd</sup> Technical Symposium on Computer Applications in Fire Protection Engineering, Society of Fire Protection Engineers, Baltimore, MD, September 2001.

Zhang, W., Hamer, A., Klassen, M., Carpenter, D., and Roby, R., **“Turbulence Statistics in a Fire Room Model by Large Eddy Simulation,”** presented at 2<sup>nd</sup> Joint Meeting of the U.S. Sections of the Combustion Institute, Oakland, CA, March 2001.

Carpenter, D. J., **“Development of a Waiver/Deviation Process for Determining Equivalent Fire Protection at United States Research Stations in Antarctica,”** presented at the International Conference on Performance-Based Fire Safety Codes and Design Methods, Ottawa, Canada, September 23-26, 1996.

***Journal Publications (Peer Reviewed):***

McAllister, J. L., Carpenter, D. J., Roby, R. J., and Purser, D., **“The Importance of Autopsy and Injury Data in the Investigation of Fires,”** *Fire Technology*, Volume 49, Number 2, 2013.

Carpenter, D. J. **“Commentary on: Chi J. H., “Metallographic Analysis and Fire Dynamics Simulation for Electrical Fire Scene Reconstruction,”** *Journal of Forensic Science*, 57(1) pp. 246-9, 2012.

Carpenter, D. J., **“Commentary on: Chi J.H., Wu S.H., and Shu C.M., Using Fire Dynamics Simulator to Reconstruct a Hydroelectric Power Plant Fire Accident,”** *Journal of Forensic Sciences*, 56(6), pp. 1639-44, 2011.

Zhang, W., Olenick, S. M., Klassen, M. S., Carpenter, D. J., Roby, R. J., and Torero, J. L., **“A Smoke Detector Activation Algorithm for Large Eddy Simulation Fire Modeling,”** *Fire Safety Journal*, 43, pp. 96 – 107, 2008.

Olenick, S. M., and Carpenter, D. J., **“An Updated International Survey of Computer Models for Fire and Smoke,”** *Journal of Fire Protection Engineering*, Vol. 13, No. 2, 2003.

Zhang, W., Hamer, A., Klassen, M., Carpenter, D., and Roby, R., **“Turbulence Statistics in a Fire Room Model by Large Eddy Simulation,”** *Fire Safety Journal*, 37, pp. 721-752, 2002.

Wade, C. A., and Carpenter, D. J., **“A Performance-Based Analysis of an Industrial Facility Containing Flammable Liquid Storage,”** *Journal of Fire Protection Engineering*, Vol. 9, No. 2, 1998.

Carpenter, D. J., and Wade, C. A., **“A Performance-Based Fire Hazard Analysis of an Industrial Process Using Pressurized Hydraulic Fluids,”** in preparation for submission to the *Journal of Fire Protection Engineering*.

***Published Reports:***

Carpenter, D. J., Churchward, D. L., Lentini, J. J., McKenzie, M. A., and Smith, D. A., **“Report on the Peer Review of the Expert Testimony in the Cases of State of Texas v. Cameron Todd Willingham and State of Texas v. Ernest Ray Willis,”** Arson Review Committee, Innocence Project, April, 2006.

DiNenno, P. J., Verdonik, D. P., and Carpenter, D. J., “**U.S. Navy Halon 1211 Replacement Plan Part I - Development of Halon 1211 Alternatives**,” Navy Research Laboratory (NRL), NRL/MR/6180-99-8410, November 1, 1999.

Mawhinney, J. R., and Carpenter, D. J., “**A Review of Fire Hazards and Fire Suppression Options for the Halifax Class Frigates of the Canadian Navy**,” Client Report A-4424.1, for Department of National Defence, National Research Council Canada, Ottawa, Canada, March 10, 1997.

Amy, J., Carpenter, D. J., and Pucci, W. E., “**Alternative Combustible Loading: Conceptual Matrix Development and Implementation (U)**,” WSRC-RP-93-1445, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, October 29, 1993.

Carpenter, D. J., “**Alternative Combustible Loading: An Overview and Methodology Framework (U)**,” WSRC-RP-93-1194, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, September 30, 1993.

## HANDBOOK CHAPTERS:

Walton, W. D., Carpenter, D. J., and Wood, C. B., “**Deterministic Computer Fire Models**,” 19<sup>th</sup> edition, *Fire Protection Handbook*, Section 3, Chapter 5, National Fire Protection Association, Quincy, MA, 2003.

Walton, W. D., Carpenter, D. J., and Wood, C. B., “**Zone Computer Fire Models for Enclosures**,” 4<sup>th</sup> edition, *The SFPE Handbook of Fire Protection Engineering*, Section 3, Chapter 7, Society of Fire Protection Engineers, Bethesda, MD, and National Fire Protection Association, Quincy, MA, 2008.

Beyler, C. L., DiNenno, P. J., Carpenter, D. J., and Watts, J. M., Jr., “**Introduction to Fire Modeling**,” 20<sup>th</sup> edition, *Fire Protection Handbook*, Section 3, Chapter 5, National Fire Protection Association, Quincy, MA, 2008.

Carpenter, D. J., “**Fire Modeling and Its Application in Fire Investigation**,” *Wiley Encyclopedia of Forensic Science*, John Wiley & Sons, New York, June, 2009.

## TELEVISION PROGRAMS:

CNN’s “Burden of Proof with Greta Van Susteren & Roger Cossack,” Waco Simulation: Burning Questions of the Branch Davidian Fire, March 23, 2000.

CNN’s “Anderson Cooper 360,” Arson Science, April 10, 2007.

Abenteuer Wissen, (German Television), Knowledge Adventures: Fatal Mistakes in the Blaze, August 31, 2007.

Investigation Discovery's "Forensics: You Decide," Episode 3: Up in Flames, August 2009.

ABC's 20/20, "Burned: Fire Scientists Question Arson Findings", Episode 3018, May 7<sup>th</sup>, 2010.

**NEWSPAPER ARTICLES:**

"More Arson Convictions Challenged by Science," Maurice Possley, Chicago Tribune, October 18, 2006.

"Arson Convictions, Fire Investigations Feel the Heat," Sue Russell, Miller-McCune Newsletter (<http://www.miller-mccune.com/article/arson-convictions-fire-investigations-feel-the-heat-980>), February 7, 2009.

"I Was Just A Junkie", Dave Mann, The Texas Observer (<http://www.texasobserver.org/features/i-was-just-a-junkie>), October 2, 2009.

**PODCASTS:**

"Episode 18 – Forensics in Flames," Michael May, The Life of the Law, (<http://www.lifeofthelaw.org/forensics-in-flames/>), July 23<sup>rd</sup>, 2013.

**Appendix C**  
**Lists of Testimony**

**Douglas J. Carpenter, MScFPE, CFEL, PE, FSFPE**

**Court Testimony:**

*State of Vermont vs. Dale Spooner*

State of Vermont District Court, Washington Circuit, Unit 2

Docket No. 898-7-99Wncr

August 1-2, 2000.

*State of Ohio vs. Angela Garcia*

Court of Common Pleas, Cuyahoga County, Ohio

Case No. CR 387760

May 21, 2001.

*State of Florida vs. Kazem Pourghafari*

Circuit Court of the 17th Judicial Circuit, Broward County, Florida

Case No. 98-15858 CF10A

Evidentiary Hearing

March 25, 2004.

*State of Florida vs. Kazem Pourghafari*

Circuit Court of the 17th Judicial Circuit, Broward County, Florida

Case No. 98-15858 CF10A

Trial Testimony

April 13, 2004.

*Harford Mutual Insurance, as Subrogee of Carriage Hill Apartments vs. Apria Health Care, Inc., and Mallinckrodt, Inc.*

United States District Court for the State of Maryland – Southern Division

Case No. DKC 03-180

Daubert Hearing

July 20, 2004.

*State of Louisiana vs. Amanda Gutweiler aka Amanda Hypes*

Ninth Judicial District Court, Rapides Parish, Louisiana

Criminal Docket No. 265037

Bail Hearing

June 23, 2006.

*Camp Takajo, Inc., Plaintiff v. Simplex Grinnell, LP and Pitre Painting Company, Inc.*

State of Maine Superior Court, Cumberland County, SS.

Civil Action Doc. No. CV-04-773

February 26, 2007.

*Anthony W. Smith and Theresa Smith, Plaintiffs, vs. Marilyn Nelson, doing business as "SIMPLY SOFAS," and DOES 1 To 50, Defendants.*

Superior Court of the State of California for the County of Los Angeles

No. BC 344555 SC 088250

October 30, 2007.

*State of North Carolina vs. Lisa Louise Greene*

General Court of Justice, Superior Court Division, Carrabus County, North Carolina

Case No. 06 CRS 50169-50171

January 9 -11, 2008.

*State of Alabama vs. Christi Michelle Scott*

Circuit Court of Franklin, Franklin County Courthouse, Russellville, Alabama

Case Number CC08-344

June 29, 2009.

*Eric Williams vs. State of Vermont*

Chittenden Superior Court, Burlington, Vermont

Docket Number: S1475-2001CnC

Trial Testimony

July 14, 2011.

*Eric Williams vs. State of Vermont*

Chittenden Superior Court, Burlington, Vermont

Docket Number: S1475-2001CnC

Trial (Rebuttal) Testimony

July 22, 2011.

*State of West Virginia vs. Ronald C. Davis*

Circuit Court for Jackson County, Ripley, West Virginia

Case No. 10-F-89

Pre-Trial Hearing

June 17, 2011.

*State of West Virginia vs. Ronald C. Davis*

Circuit Court for Jackson County, Ripley, West Virginia

Case No. 10-F-89

Trial Testimony

September 8, 2011.

*State of Texas vs. Sharon Watkins*  
338th District Court of Harris County, Houston, Texas  
Cause Numbers 1179714 and 1181065  
Pre-Trial (Daubert-Kelly) Hearing  
September 16, 2011.

*State of Texas vs. Sharon Watkins*  
338th District Court of Harris County, Houston, Texas  
Cause Numbers 1179714 and 1181065  
Trial Testimony  
October 5, 2011.

*State of Indiana vs. Glenn Patrick Bradford*  
Vanderburgh Circuit Court, County of Vanderburgh  
Cause No. 82C01-9209-CF-512  
PRC Hearing Testimony  
October 12, 2011.

*State of Georgia vs. Sheree Dionne Murphy*  
Magistrate Court of Clayton County, State of Georgia  
Warrant No.: CW-22474 through CW-22479, CW-2281, CW-2282  
Trial Testimony  
December 9, 2011.

*State of Texas vs. Edward E. Graf, Jr.*  
54th District Court of McLennan County, Waco, Texas  
Trial Court Cause No. 1987-1041-C2A  
Post-Conviction Writ of Habeas Corpus Hearing Testimony  
January 11, 2013.

*KEN TEEL, individually and as representative of the ESTATE OF BRENNEN CHASE TEEL; BECKY TEEL; ROSS RUSHING and MEG RUSHING, individually and as next friend of L.R., a minor; STATE FARM LLOYDS INSURANCE COMPANY, as subrogee of Ross Rushing and Meg Rushing; and SAFECO INSURANCE COMPANY, as subrogee of Ross Rushing and Meg Rushing, Plaintiffs, vs. TITEFLEX CORPORATION, GASTITE DIVISION; TURNER & WITT PLUMBING, INC.; MSC HOLDINGS, INC., f/d/a MORRISON SUPPLY COMPANY-LUBBOCK, INC.; and JERROD GRIFFITH d/b/a TEXAS ELECTRIC COMPANY, Defendants, vs. THERMO DYNAMIC INSULATION; STRONG CUSTOM BUILDERS, LLC; and; LENNOX HEARTH PRODUCTS, LLC, Third-Party Defendants.*

DISTRICT COURT, 72nd JUDICIAL DISTRICT LUBBOCK COUNTY, TEXAS  
Cause No. 2012-5044105  
Pre-Trial (Daubert-Kelly) Hearing  
June 5, 2014.



*State of Texas vs. Edward E. Graf, Jr.*  
54th District Court of McLennan County, Waco, Texas  
Trial Court Cause No. 1987-1041-C2A  
Hearing Testimony  
October 15, 2014.

*State of Texas vs. Edward E. Graf, Jr.*  
54th District Court of McLennan County, Waco, Texas  
Trial Court Cause No. 1987-1041-C2A  
Trial Testimony  
October 16, 2014.

*People of the State of Illinois vs. William E. Amor*  
Circuit Court of the Eighteenth Judicial Circuit, County of Du Page, State of Illinois  
Case No. 95 CF 2075  
Evidentiary Hearing  
December 12-13, 2016.

*M/V MSC Flaminia*  
United States District Court Southern District of New York  
Case No. 12 CIV 8892 (SAS)  
September 18, 2017.

*Susan Rattner vs. Chubb National Insurance Company*  
United States District Court for Eastern District of Virginia, Alexandria Division  
Case No. 1:17-cv-00136-LBM-MSN  
October 16, 2017.

*People of the State of Illinois vs. William E. Amor*  
Circuit Court of the Eighteenth Judicial Circuit, County of Du Page, State of Illinois  
Case No. 95 CF 2075  
Trial Testimony  
January 29, 2018.

*State of Oklahoma vs. Derek Don Posey*  
District Court of Canadian County, State of Oklahoma  
Case No. CF-2013-463  
May 13-14, 2019.

*Lawrence Turcotte vs. State Farm Fire and Casualty Company*  
District Court, County of Larimer, State of Colorado  
Case No. 18CV030205  
October 17, 2019.

*State of Oregon vs. Kenneth Ketchem*

Circuit Court of the State of Oregon in the County of Marion

No. 19CR05609

October 22, 2020.

**Deposition Testimony:**

*State of Vermont vs. Dale Spooner.*

State of Vermont District Court, Washington Circuit, Unit 2

Docket No. 898-7-99Wncr

February 1, 2000.

*Natural Lifestyles, Inc., d/b/a Vermont Trading Company vs. David F. Kelly and Valerie Meggison*

State of Vermont District Court, Washington Circuit, Unit 2,

Docket No.

June 8, 2000.

*Bobbi-Jo Perreault, Administrator of the Estates of Tyler Scott Billado, Ryan Andrew Francis, troy Phillip Joseph Perreault; and Bernard A. Perreault, Administrator of the Estate of Amelia G. Perreault, vs. Stokes Corporation.*

State of Vermont District Court, Chittenden County, SS.

Docket No. S622-00 CnC

October 31, 2001.

*The Vestry of St. Andrews Church, Protestant Episcopal Church vs. Marvel Lighting Corporation and E.C. Jackson Supply Co., Inc.*

District Court, 181st Judicial District, Potter County, Texas

Docket No. 84, 524-B

July 2, 2002.

*Hardel Mutual Plywood Corporation vs. City of Olympia*

Supreme Court, Thurston County, Washington State

Case No. 00-2-00291-0

September 26-27, 2002.

*State of Florida vs. Kazem Pourghafari*

Circuit Court of the 17th Judicial Circuit, Broward County, Florida

Case No. 98-15858 CF10A

November 25, 2003.

*Harford Mutual Insurance, as Subrogee of Carriage Hill Apartments vs. Apria Health Care, Inc., and Mallinckrodt, Inc.*

United States District Court for the State of Maryland – Southern Division

Case No. DKC 03-180

December 16, 2003.

*The Travelers Indemnity Company of Illinois, as Subrogee of Fred Garmon Marketing Corp. and The Charter Oak Fire Insurance Company, as Subrogee of Computer Software Consultants, Inc. and Elizabeth Grady Face First, Inc. vs. G & K, LLC, a/k/a Goode & Kriensky, LLC and Sidney Kriensky, Keyes North Atlantic Co., Inc. CCX Construction Corp. d/b/a M&M Engineering, and Seaco Insurance Company*

Commonwealth of Massachusetts – Superior Court, Middlesex, SS.

Civil Action No. 0201478

March 30, 2004.

*Catherine Reuter vs. Washington Hospital Center Corporation*

United States District Court for the District of Columbia

Case No. 1-03CV

May 26, 2004.

*Douglas O. Kitchen v. Krohn Homes, LLC (Deposition)*

American Arbitration Association

Case No. 30-Y-11000327-04

December 2, 2004.

*Douglas O. Kitchen v. Krohn Homes, LLC (Testified at Arbitration Hearing)*

American Arbitration Association

Case No. 30-Y-11000327-04

December 28, 2004.

*Daniel F. Knise and Kathleen P. Knise v. Mitchell Fagan Painting Company*

Circuit Court for Fairfax County, Virginia

Law No. 223556

April 25, 2005.

*Mayor and City Council of Baltimore, et al., Plaintiffs v. CSX Transportation, Inc., et al., Defendants*

United States District Court for the State of Maryland – Northern Division

Civil Case No. 04-CV-2348 (RDB)

September 6, 2005.

*Camp Takajo, Inc., Plaintiff v. Simplex Grinnell, LP and Pitre Painting Company, Inc., Defendants*

State of Maine Superior Court, Cumberland County, SS.

Civil Action Doc. No. CV-04-773

February 25-26, 2006.

*Rodney and Bobby Jo Knepp, individually and as Parents and Natural Guardians of Tyler and Dakota Knepp v. Lawrence H. and Rosearie C. Baird*

Court of Common Pleas in and for the County of Montgomery, Pennsylvania

Civil Action No. 03-05546

Arbitration Hearing

March 7, 2006.

*Camp Takajo, Inc., Plaintiff v. Simplex Grinnell, LP and Pitre Painting Company, Inc., Defendants*  
State of Maine Superior Court, Cumberland County, SS.

Civil Action Doc. No. CV-04-773

April 12, 2006.

*Antrunette Howard, Administrator of the Estate of Djanay Hampton, Deceased, Et Al., Plaintiffs*  
*vs. East Lake Management & Development Corporation of Chicago, Et. Al., Defendants*

In the Circuit Court of Cook County, Illinois, County Department – Law Division

March 8, 2007.

*John Kane As Administrator Of The Estate of Jennifer Kane, Plaintiff v. David L. Krugman, In His*  
*Capacity As Finance Director For The Town Of Narragansett, And John Does I-X*

State of Rhode Island and Providence Plantations Washington, SC. Superior Court

Case No. 03L 13598

August 29, 2007.

*Anthony W. Smith and Theresa Smith, Plaintiffs, vs. Marilyn Nelson, doing business as “SIMPLY*  
*SOFAS,” and DOES 1 To 50, Defendants*

Superior Court of the State of California for the County of Los Angeles

No. BC 344555 SC 088250

October 4, 2007.

*United Services Automobile Association vs. Potomac Electric Power Company and Asplundh Tree*  
*Expert Company*

Circuit Court for Montgomery County, Maryland

Case No. 298478-V

May 5, 2009.

*Federal Insurance Company, as Subrogee of Joseph Gonzalez vs. Builder Services Group, Inc.,*  
*d/b/a Coastal Insulation, Inc. and Karl Owens, LLC*

United States District Court, Northern District of Florida, Pensacola Division

Case No. 3:08-CV-481-MCR-EMT

May 26, 2009.

*Arch Chemicals, Inc. vs. Radiator Specialty Company*

United States District Court, District of Oregon

Case No. 3:07-cv-1339-HU

July 16, 2010.

*George M. Muteff, Executor of the Estate of Virginia C. Miller vs. Invacare Corporation and*  
*American Mobility, LLC*

General Court of Justice, Superior Court Division, Wake County, North Carolina

Case No. 08 CVS 11624

July 20, 2010.

*Michael S. Hippert vs. Trane US Inc. et al.*  
Court of Common Pleas, Hamilton County, Ohio  
Case No. A0806404  
August 13, 2010.

*Ralph James Puckett, III, vs. The Plastics Group, Inc.*  
United States District Court for the Northern District of Georgia, Atlanta Division  
Civil Action File No. 1:11-CV-1120  
August 31, 2011.

*Linger Longer Development Company, and Fireman's Fund Insurance Company, as Subrogee of Linger Longer Development Company vs. Tampa Armature Works, Inc.*  
United States District Court for the Northern District of Georgia, Athens Division  
Civil Action No. 3:10-CV-68(CDL)  
December 13, 2011.

*Philadelphia Insurance Company, as Subrogee of South Texas Affordable Properties Corporation D/B/A The Charleston Apartments and South Texas Affordable Properties Corporation D/B/A/ The Charleston Apartments vs. Dell, Inc. D/B/A Dell Computer, Inc., A Delaware Corporation, LG Chem America, Inc., and LG Chem, LTD*  
District Court of Harris County, Texas, 295th Judicial District  
Cause No. 2010-18442  
June 26, 2012.

*Traci Armstrong Evans, as Conservator and Gardian of Klay Armstrong, et al. vs. Albany Electric Company, et al.*  
State Court of Early County, State of Georgia  
Civil Action No. 2008-062  
December 4, 2012.

*Nationwide Insurance Company a/s/o Mark and Deborah Minck, Pliantiffs, vs. Masco Services Group Corporation d/b/a Gale Insulation; Pridgen Homes, Inc. f/k/a Orange State Builders and Developers, Inc., American Strategic Insurance Corporation, Plaintiff, vs. Masco Services Group Corporation, d/b/a Gale Insulation; Pridgen Homes, Inc. f/k/a Orange State Builders and Developers, Inc., Defendants*  
Circuit Court of the 8th Judicial Circuit in and for Alachua, Florida  
Case No. 2013-CA-000705 and 2012-CA-3091 K  
September 10, 2013.

*KEN TEEL, individually and as representative of the ESTATE OF BRENNEN CHASE TEEL; BECKY TEEL; ROSS RUSHING and MEG RUSHING, individually and as next friend of L.R., a minor; STATE FARM LLOYDS INSURANCE COMPANY, as subrogee of Ross Rushing and Meg Rushing; and SAFECO INSURANCE COMPANY, as subrogee of Ross Rushing and Meg Rushing, Plaintiffs, vs. TITEFLEX CORPORATION, GASTITE DIVISION; TURNER & WITT PLUMBING, INC.; MSC HOLDINGS, INC., f/d/a MORRISON SUPPLY COMPANY-LUBBOCK, INC.; and JERROD GRIFFITH d/b/a TEXAS ELECTRIC COMPANY, Defendants, vs. THERMO DYNAMIC INSULATION; STRONG CUSTOM BUILDERS, LLC; and; LENNOX HEARTH PRODUCTS, LLC, Third-Party Defendants*

DISTRICT COURT, 72nd JUDICIAL DISTRICT, LUBBOCK COUNTY, TEXAS

Cause No. 2012-5044105

May 5, 2014.

*Winding River Village Condominium Association, Inc. vs. City of Sandy Springs, Georgia; City of Atlanta, Georgia*

Superior Court of Fulton County, State of Georgia

Civil Action File No. 2012CV214993

January 23, 2015.

*State of Indiana vs. Mark Leonard*

St. Joseph Superior Court, County of St. Joseph, State of Indiana

Cause No. 71D02-1408-MR-000009

April 27, 2015.

*Edward J. Davis & Sons Corp. vs. Universal Underwriters Insurance Co.*

United States District Court for the District of Vermont

Civil Action No. 5:13-CV-286

July 20, 2016.

*M/V MSC Flaminia*

United States District Court Southern District of New York

Case No. 12 CIV 8892 (SAS)

November, 14, 2016.

*Heather Sutton, et al. vs. Mitchell Plumbing & Heating, Inc.*

Circuit Court for Baltimore City, Maryland

Case No. 03-C-16-006516

October 27, 2017.

*Lawrence Turcotte vs. State Farm Fire and Casualty Company*

District Court, County of Larimer, State of Colorado

Case No. 18CV030205

January 31, 2019.



*Coratrina Brent vs. Ambassador Services Inc. and Associates Plumbing, Inc. and Oaklee Village Baltimore, LLC*

Circuit Court for Baltimore City, Maryland

Case No. 24-C-18-004011 OT

August 22, 2019.

*Janet Touse vs. Jiffy Plumbing & Heating, Inc., et al.*

Circuit Court of Maryland for Prince George's County

Case No. CAL19-14285

October 8, 2020.

*William E. Amor vs. Michael Cross, et al.,*

United States District Court for Northern District of Illinois Eastern Division

Case No. 18 CV 2523

March 31, 2021.